

THE
SCIENTIFIC JOURNAL.

NEW-YORK, JULY, 1818.

To the Editor of the Scientific Journal

New-York, June, 1818.

SIR,

I do not think you can appropriate two or three pages of your valuable journal to a better purpose, than in giving place to the following biographical sketch of the late JOHN H. EDDY, of New-York. It is taken from the American Monthly Magazine, published in this city by Messrs. Bigelow and Holley. More might have been said of the deceased than what the writer of the sketch has seen fit to advance. As a *mathematician*, Mr. Eddy had strong claims to notice ; and should any calculations by him, on this branch of study, be rescued from the mass of his papers which he has left, I shall venture to transmit them to you for publication. Mr. Eddy was a remarkable instance of the successful communication of knowledge by signs ; and I doubt whether the Abbe Sicard or Dr. Watson ever boasted of a more distinguished proficient. The writer of the sketch might also have stated, that the great map, to which Mr. Eddy devoted so large a portion of the latter period of his life, and for which he incurred such heavy pecuniary expenses, was, prior to his decease, submitted to a committee of the Literary and Philosophical Society of New-York, who made the most favourable reports on his important labours.

X.

*Biographical Sketch of the late Geographer, JOHN H. EDDY,
of New-York.*

The subject of the following memoir, died at the house of his father, on the morning of the 22d of December last, in the thirty-fifth year of his age. The few particulars of his life, which are here given, though drawn up by the hand of friendship, are stated with all the impartiality of truth, and it is hoped may serve to furnish to the reader some idea of the unwearied industry and extensive attainments of the deceased, though labouring under one of the most severe calamities incident to humanity. Those who were happy in a personal knowledge of the subject of this hasty sketch, can best bear testimony to his integrity as a man, and to his warmth and constancy as a friend; while the manner in which he performed his several duties, must have left an indelible impression on the hearts of those who were the peculiar objects of them.

John H. Eddy was the eldest son of Thomas Eddy, Esq. of New-York, and was born in this city, in 1784. At an early age he entered upon the study of the ordinary elements of education, and equally by the ardour of his application, and by his progress in knowledge, while labouring under all the disadvantages of a total deprivation of hearing, engaged the most affectionate sympathy of his friends. It was between the twelfth and thirteenth years of his age, that he had the great misfortune to lose entirely the sense of hearing, by a dangerous and protracted attack of the scarlet fever. Notwithstanding the great personal disadvantage under which he thus laboured, the powers of his mind were not suffered to lie dormant, and he improved with great earnestness every opportunity of cultivating them. To an ample knowledge of the Latin and French languages, he added that of algebra and the mathematics, all which he acquired without assistance from teachers. The in-

tervals of time not devoted to these substantial pursuits, were occupied in reading; and few persons of his age have excelled him in the knowledge of ancient and modern history. It was his practice during the winter to rise an hour or two before day-light, and apply himself in the morning to general reading, and during the course of the day he seemed to be every moment employed in the pursuit of some favourite study.

That such ardent and constant intellectual exertions were not calculated to do good to his constitution, will not excite surprise; and the anxiety of his relatives became awakened at the symptoms of disease which he himself little regarded. In order to restore him to his former health, he was persuaded to abandon for a time his closet studies. It has often been observed, that a change of mental occupation is itself sufficient for the purposes of physical renovation. He now resolved to indulge that fondness for the works of nature, to which, at an early age, he had formed an attachment, but which he had, from various circumstances, been prevented from gratifying. That his attainments in this pleasing department of rational investigation, entitled him to high praise, cannot be denied; and the success that attended his labours in botany and mineralogy, is known to the cultivators of these branches of science.

But, while thus engaged, Mr. Eddy did not neglect those ornamental studies which enable the possessor to take a part in elegant and polite conversation, but of which, from his peculiar situation, he was painfully deprived. His taste was improved by the perusal of the best poetical and prose authors of the present and former times. What he himself wrote, he communicated in a style characterized by its perspicuity and force: and in his occasional interviews with the muses, he evidenced some of the stronger marks of genuine poetry. In a small volume of manuscript poems which he has left, there is one written on the occasion of his loss of hearing, in which he deplores, in plaintive accents, what so seriously affected his sensibility;

and in no other instance has he ever been known on that account to utter a complaint.

Geography, however, was the favourite pursuit to which Mr. Eddy was attached: it is by his acquisitions on this important subject, that he is to be especially regarded. How large were his pecuniary expenditures, what sacrifices of time and of health he made in order to acquire correct geographical knowledge, how honourably he supported his pre-eminence, and how extensively was his usefulness in this study directed for the benefit of his country, are circumstances familiarly known and universally admitted. He maintained an extensive correspondence with many of the most eminent characters in England and France, as well as in different parts of the United States, on geographical topics. The several maps which he published exhibit a display of taste and science exceeding any thing of the kind that had been presented to the American public. Among the first of these was his circular map of thirty miles round New-York, which appeared in 1814. He also published, at the request of the Canal Commissioners, a map of the western part of the state of New-York, with the proposed tract of the intended canal from lake Erie to the Hudson, accompanied with an accurate profile of the levels, and with a scale showing the number of feet of each level above Hudson river and below lake Erie. Next followed, at the request of his excellency governor Clinton, the President of the Board of Canal Commissioners, a map illustrative of a communication between the Great Lakes and the Atlantic ocean, by means of lake Erie and Hudson river. On this map are laid down the North-Western Territory, Illinois, Indiana, Ohio, Kentucky, the western part of Virginia, Pennsylvania, and the western part of the state of New-York; with a table, showing the respective distances from principal places to New-Orleans, New-York, Montreal, &c. About the same time he gave to the public a map of the Niagara river, with a profile view of the country from lake

Erie to lake Ontario. The materials of these different maps were derived from the best sources, and the accuracy of his illustrations could not be questioned. Mr. Eddy had, more than two years before, viz. in 1812, accompanied his father and other commissioners for the purpose of exploring the western part of the state, and of ascertaining the practicability of a canal communication between lake Erie and the Hudson.

A short time previous to his death, Mr. Eddy finished a map of the state of New-York. This may be pronounced his best executed work: as to style, accuracy, and scientific arrangement, it may be safely said to exceed all other maps hitherto published in America. It cost him nearly four years of unremitting labour: his materials were original; he collected them with uncommon care, and incurred great expense in obtaining distinct surveys of every county in the state.*

He had also engaged in other important labours of a like nature. Governor Dickenson, of New-Jersey, and a number of gentlemen of that state, made application to Mr. Eddy to undertake a map of New-Jersey, and, with that view, furnished him with considerable surveys. The legislature, anxious that this work should be executed by one so competent, passed a resolution, unsolicited and unknown to Mr. E. directing that he should be supplied from the public offices of the state with such copies of surveys or records as he might suppose useful for his purpose. He collected no small amount of information for the Jersey map.

The premature death of this useful man has also deprived the country of an American atlas, which he had been solicited to undertake by a number of enterprising individuals. Nothing, perhaps, would more conclusively have shown how defective and erroneous are the European maps, as it respects the geography

* The writer is informed, this valuable map will not be lost: the engraving is stated to be already executed, by able artists in Philadelphia, and copies of the work will be published with all convenient expedition by Messrs. James Eastburn & Co. of New-York

of the United States. The enterprising projectors of the atlas intended it as a national work : they have now to lament the death of him whom they deemed so abundantly qualified to take the lead in this great attempt, and they have candidly expressed that the loss of his assistance is irreparable.

Mr. Eddy was the author of a number of essays which appeared in the newspapers, on botany and other branches of natural history, on geography, and the internal improvement of this state. An essay on geography, which he intended for publication in this magazine, will probably shortly appear. He was a member of the New-York Historical Society, and, in 1816, was elected to a similar honour in the Literary and Philosophical Society of New-York. To this latter association he communicated an interesting memoir on the geography of Africa. That unfortunate mariner, Captain James Riley, the narrative of whose sufferings has awakened so large a portion of public attention, had applied to Mr. Eddy to draw for him a map of part of Africa. This gave Mr. Eddy the occasion of examining the different accounts that had been published by different travellers on African geography ; and, without passing sentence of condemnation on any writer for wilful misrepresentations, he gives due credit to the statement of Capt. Riley. Capt. Riley has, indeed, been pronounced a loose writer by an anonymous reviewer,* but the testimonies to his worth and veracity are more respectable, and, besides, he is subject to the evidence of living witnesses. It cannot be denied that his

* Vide Quarterly Review, No. xxxiv. " Capt. Riley, it would appear, however competent as a mariner, was far from being a good anatomist and physiologist. He has stated that the weight of some of his companions, on their reaching Mogadore, did not exceed forty pounds each ; whereas he ought to have been aware that the weight of the skeleton of a common sized man would be 13 1-2 pounds ; the usual weight of the brain 4 1-2 pounds ; that of the circulating blood 27 pounds ; so that there are 45 pounds without either muscles or intestines." Did the Quarterly Reviewer want more decisive proof of the general inaccuracy of Capt. Riley's whole statement of his shipwreck, sufferings, and sojournings ?

work contains most important views of interior Africa : and it is gratifying to observe, that a gentleman possessed of the talents and learning of Hugh Murray, Esq. should, in his enlarged edition of Leyden's Historical Account of Discoveries and Travels in Africa, pay the tribute of high regard to our American narrator.

Enough has been said to show that the strongest principle of action in John H. Eddy, was the laudable desire to be useful : that he was superior to making a trade of liberal pursuits, and generous in pecuniary matters, is admitted by those to whom he was best known. To conclude this hasty sketch : it is unfortunately too frequently our lot to lament the seemingly untimely departure of aspiring genius and worth ; but it may confidently be said, seldom could our regret and lamentation be more feelingly bestowed than on the subject of this brief memorial. Time and talents have rarely been more constantly or more undeviatingly directed to objects of substantial importance ; and it is painful to reflect that his fatal illness was prematurely induced in consequence of such exertions. Let the qualities of his heart and his moral excellence command our regard ; for the service he has rendered, let the debt of gratitude be paid to his memory. W.

On Vegetable Instinct, and the Sleep and Sensation of Plants.

BY MR. TUPPER.

(Concluded.)

AQUATIC plants also furnish some curious examples of spontaneous motion strongly characteristic of instinct. Among these, the *water-lily* affords a very remarkable instance, and that connected with the reproduction of its species. This plant bears its flowers upon a foot-stalk under water, and when the flowering season arrives, the stalk rises perpendicularly, without any

regard to the stream, until the flowers reach above the surface of the water. At this time some of them expand, and then the antheræ discharge their fecundating dust upon the stigma. About four o'clock in the afternoon, the expanded flowers close, and the foot-stalk lies down either upon or under the water. It is erected every day, until the flower has been completely impregnated, when it once more sinks under water, and there remains to ripen its seeds, which, at a proper time, escape from the fruit, and give birth to new individuals.

This is asserted by Linnæus, and various other naturalists; and, though controverted by some, has been recently confirmed by the observations of Dr. Smith, who authorizes me to make use of his name on this occasion. In cold or shady weather, this phenomenon is less evident, and is explained by the writer, last named, as entirely owing to the stimulus of light. But yet, I presume, it is also in part referable to instinct, and that light operates only as an auxiliary to that phenomenon.

Besides the above examples of spontaneous motion in vegetables, there are other instances of it, which take place on such particular occasions, as strongly indicate the presence of sensation in this class of beings; and if they are endued with any degree of it, may we not very consistently suppose that they are also capable of instinctive actions? These instances of motion are observed towards evening, and during the night, when plants are supposed to have also their season of *sleep*; and the external character of many of them appears so changed at the time, that it is often difficult to recognize their species. In some plants, the leaves hang down by the side of the stem; in others, they rise and embrace it, and in some they are disposed in such a way as to conceal all the parts of fructification.

Motions of a similar kind also take place in the flowers. Some of these during the night fold themselves up in their calices; some only close their petals, while others incline their mouth or opening towards the ground. The mode of sleep varies, therefore, in different species of plants; and in consequence of

this alteration of position in the flowers as well as the leaves, the young and tender stems, buds, fruits, &c. are sheltered from the injurious effects of rain or dews, and the cold nocturnal air.

The propriety of applying the term *sleep* to these phenomena, may, however, be disputed; and the occurrence of them ascribed to the absence of the stimulus of light. But although this may have some share in producing these effects, yet it can only act as a partial cause, which indeed operates in a very similar manner on animals; for the absence of light is also favourable to their *sleep*, and this fact seems to point out the analogy between *sleep*, strictly so called, and the effects which take place in plants, under the circumstances above-mentioned.

However, leaving it to abler physiologists to decide on the propriety of the term, it is at all events very evident that an interval of rest is as necessary to the health and vigour of the vegetable, as it is to that of the animal.

Many other examples of instinctive and spontaneous motion in vegetables might be adduced; but it is not necessary to particularize more in this place, as the instances already noticed are fully sufficient to show that plants have the power of self-motion; and as they contribute thereby to their well-being, it is reasonable to conclude that they are, like animals, also capable of instinctive actions: and if instinct is the consequence or the necessary adjunct of sensation in the one, it is more than probable it is so likewise in the other.

Indeed, it is supposed by Darwin, that they even possess voluntary power; and this he infers from their "being subject to sleep." He says, "that as the sleep of animals consists in the suspension of voluntary motion, and as vegetables are likewise subject to sleep, there is reason to conclude that the various acts of opening and closing their petals and foliage, may be just-

ly ascribed to a voluntary power ; for without the faculty of volition, sleep would not have been necessary to them.*

The several phenomena which have been noticed on this curious subject, do certainly afford some ground for supposing that sleep is more or less necessary to the welfare of vegetables, as well as that of animals. But although there is in this state " a suspension of voluntary motion," at least in those animals which are endued with this power, yet it does not necessarily follow that sleep is a criterion of its existence, for volition is an attribute of mind, associated with a degree of rationality, which, in most animals, is compensated for by that instinctive power which I have before endeavoured to show is distinct from volition. I do not apprehend, therefore, that sleep is necessarily indicative of the existence of a voluntary power, although it may be so of a sensitive one.

When we speak of a living animal, we naturally associate the idea of sensation with that of its existence ; but this does not, at the same time, give us any notion of the particular nature of the pleasure or pain of which the animal is susceptible. The same impressions will create very different sensations in animals of different species ; and this difference will probably be still greater between those animals which inhabit different elements. Some of each class are furnished with similar organs of sense, which organs appear to be constructed on the same plan in the individuals of each element : but yet we shall find a peculiarity of structure adapted to the economy of the species ; and that peculiarity of structure, as well as the different nature of the element in which they exist, must consequently occasion a difference in their respective sensations. Hence, as vegetables are necessarily so different from animals, in their mode of existence, it is very evident that we cannot form any idea how they feel affected under any circumstances ; but we are not on

* Vide Darwin's *Zoonomia* ; also Botanic Garden, Note on Chunda.

that account to conclude that they are destitute of every kind of sensation. "As they possess life, irritability, and motion, spontaneously directing their organs to what is natural and beneficial to them, and flourishing according to their success in satisfying their wants—may not the exercise of their vital functions be attended with some degree of sensation, however low, and some consequent share of happiness?"*

Gleanings.

Derivation of Welch Names, &c.—The old Britons were the first of six nations which had possession of this land successively, viz. old Britons, Belgæ, Romans, Saxons, Danes, and Normans. The old Britons came originally from the tower of Babel, thus: shortly after the deluge, the Lord having blessed Noah and his posterity, saying, "be fruitful, multiply, and replenish the earth;" they notwithstanding had been fruitful, and had, in a short time, multiplied incredibly, yet they obstinately refused to replenish the earth, but said, "Go too, let us build a citie and a tower in it, whose topp may reach unto heaven, least we be scattered over the face of the whole earth;" so they intended to dwell in their citie together, and to secure them from any future flood in the tower, but the Lord confounded their one (the Hebrew) into 52 languages, so that they not understanding each other, *babbling* about carrying on the worke, were necessiated to give it over unfinished, and then each principall man among them having sought out, and brought together, such as could understand his language, conducted them into the severall partes of the earth, where many of them are called after their conductor's names to this day; as the *Medes* from *Madia*; the *Muscovites* from *Mescch*, alias

* Vide Smith's Introduction to Botany.

Masoch; the *Canaanites* from *Canan*; and *Gomer* the eldest son of *Japhet*, calling together such as could understand *Gomerarg*, as the speech of *Gomeri*, conducted them to, and seated them in France, where they were called *Gomeri*, after old *Gomer*, and some of them into *Britaine*. But because he doth not particularize the place where they were first seated, give me leave to conjecture that it was mount *Gomeri* in Wales, (for that is called *Trefaldguin*, the famous old Town.) From mount *Gomeri*, they might dilate their plantation over all *Mount Gomershire*, still called *Gomeri*, as long as they had such garments as their forefather's had; but these being worn out, and they being destitute (in this wilderness) of means to recruit apparel, yet found expedients to paint their naked bodies with several colours of cloathes, and then they were no longer called *Gomeri*, but *Britons*, i. e. *Painters*, and their land *Britaine*, i. e. the painted nations. Some families painted *GWIN*, *white*, some *DHU*, *black*, some *GLASS*, *blue*, some *GOCH*, (pronounced *goff*,) *red*, some *LLOID* (pronounced *floid*,) *green*; and this is the original of those common names, *GWIN*, *DHU*, *GLASS*, *GOFF*, and *FLOYD*, amongst their posteritie in Wales to this day.

HEARNE'S TRACTS.

Talents and Genius.—A man of *talents* has a much fairer prospect of good fortune than a man of *genius*. There are few instances of *talents* being neglected, and fewer still of *genius* being encouraged. The world is a perfect judge of talents, but thoroughly ignorant of genius. Any art already known, if carried to a greater height, is at once rewarded; but the creations of *genius* are not at first understood, and there must be so many repetitions of the effect before it is felt, that, most commonly, death steps in between genius and its fame.

Red Sea.—So called, not from any redness of either water, weeds, &c. but because anciently called the sea of Edom, as being partly on the coast of Edom; the, Greeks knowing that Edom signified *red*, by mistake called it the Erythrean, or *red sea*.

COLLYER'S SAC. INT.

Description of a remarkable Alternating Boiling Spring.

MR. MARRAT,

Perhaps the following description of a remarkable *Alternating Geyser*, or boiling spring, extracted from Sir G. S. Mackenzie's "*Travels in Iceland*," lately published, may afford some amusement to your readers. If any of them can satisfactorily account for the phenomenon, they will greatly oblige,

Your humble Servant,

J. B——N.

"ABOUT a mile further down, at the foot of the valley, is the Tonga hver, an assemblage of springs, the most extraordinary, perhaps, in the whole world. A rock rises from the bog about twenty feet, and is about fifty yards in length, the breadth not being considerable. This seems formerly to have been a hillock, one side of which remains covered with grass, while the other has been worn away, or perhaps destroyed at the time when the hot water burst forth. Along the face of the rock are arranged no fewer than sixteen springs, all of them boiling furiously, and some of them throwing the water to a considerable height. One of them, however, deserves particular notice. On approaching this place, we observed a high jet of water near one extremity of the rock. Suddenly this jet disappeared, and another, thicker but not so high, rose within a very short distance of it. At first we supposed that a piece of the rock had given way, and that the water had at that moment found a more convenient passage. Having left our horses, we went directly to the place where this had apparently happened; but we had scarcely reached the spot, when this new jet disappeared, and the one we had seen before was renewed. We observed that there were two irregular holes in the rock, within a yard of each other; and while from one a jet proceeded to the height of twelve or fourteen feet, the other was full of boiling water. We had scarcely made this observation, when the

first jet began to subside, and the water in the other hole to rise ; and as soon as the first had entirely sunk down, the other attained its greatest height, which was about five feet. In this extraordinary manner these two jets played alternately : the smallest and highest jet continued about four minutes and a half, and the other about three minutes. We remained admiring this very remarkable phænomenon for a considerable time, during which we saw many alternations of the jets, which happened regularly at the intervals already mentioned.

“ I have taken the liberty to give a name to this spring, and to call it the Alternating Geyser.

“ To form a theory of this regular alternation is no easy matter ; and it seems to require a kind of mechanism very different from the simple apparatus usually employed by nature in ordinary intermitters, or spouting springs. The prime mover in this case is evidently steam, an agent sufficiently powerful for the phænomena. The two orifices are manifestly connected ; for as the one jet sinks towards the surface, the other rises, and this in a regular and uniform manner. I observed once, that when one of the jets was sinking, and the other beginning to rise, the first rose again before it had quite sunk down, and when this happened, the other ceased to make any efforts to rise, and returned to its former state, till the first again sunk, when the second rose and played as usual. This communication must be formed in such a manner that it is never complete, but alternately interrupted, first on one side and then on the other. To effect this without the intervention of valves, seems to be impossible, and yet it is difficult to conceive the natural formation of a set of permanent valves ; so that this fountain becomes one of the greatest curiosities ever presented by nature, even though in attempting to explain the appearances it exhibits, we take every advantage that machinery can give us. If it is occasioned by natural valves, these must be of very durable materials, in order to withstand continual agitation and consequent attrition.

“ Not having obtained any explanation which I can consider quite satisfactory, and having been unable entirely to overcome the difficulty myself, I leave its solution to the ingenuity of those who may think the phænomenon of the Alternating Geyser worthy the exercise of their talents.”

Solutions to Philosophical Questions.

Qu. 11.

Mr. S. Veal. I presume that the intention of boiling wort, previous to fermentation, is to facilitate the decomposition of the wort, which is afterwards to be completed in the gyle tun. The wort, previous to boiling, is one uniform turbid wash, and would remain so, were no boiling, or fermentation, to take place. The process of boiling causes the parts which were before intimately connected to separate; and the wort then assumes a transparent appearance, with little flaky concretions floating in it. When the wort is in a state of rest, these concretions will subside to the bottom, and they are then called the grounds. I believe it is possible, by fermentation alone, to produce a transparent liquor, but the time requisite to accomplish it generally changes the wort into vinegar. The brewer, however, has another object in view, namely, the extracting the bitter principle from the hops, which cannot be conveniently effected by any other method than that of boiling them in the wort; and the time required to extract the flavour of the hop will suffice to separate the component particles of the malt, so as to produce by fermentation, a vinous, transparent, and palatable beverage. The distillers whose only object is to obtain ardent spirit, do not boil their wort. Mr. Bamford, Mr. J. Smith, and Mr. Nowell, sent answers.

Qu. 12.

Y. of *New-Haven*. The first of the corollaries here referred to will appear, on an attentive perusal, too evidently true

to require any comment. If any doubt can exist concerning the truth of the second, it must arise from the circumstance that the ratio of the forces required to make a body revolve in the same orbit about different centres, determined in the first for the circle alone, is applied, in the second, to curves in general. It may seem that, admitting the centripetal force in any curve to be the same at any point as in the circle of equal curvature at that point, yet a conclusion obtained for a circle given in magnitude and position, cannot be safely extended to the case of a circle continually varying in magnitude and position, as is the osculatory circle of curves in general. But this difficulty will be removed by observing, that in the first cor. those quantities are purposely exterminated which are peculiar to a single circle, and the ratio is expressed in terms of the lines drawn from the two centres of force to the same point of the orbit; and a line drawn from the first centre of force, and parallel to the distance of the revolving body from the second centre of force, and meeting a tangent to the orbit drawn through the place of the body: lines which have no dependence on an osculatory circle of fixed position and magnitude

NEW PHILOSOPHICAL QUESTIONS.

Qu. 13. *By Nauticus.*

What is the nature of the curve which bounds the visible horizon in 40° N. latitude?

Qu. 14. *By Nauticus.*

In theory, is what is called the *dip*, at any given altitude above the sea, in *different* latitudes, a *constant quantity*?

Qu. 15. *By Janus.*

Let the earth be a sphere at rest, and impediments of every kind removed—if a body were projected from the equator, along an inclined plane (coinciding with any meridian) that rises uniformly in the whole circumference of the earth just 100 feet, with what initial velocity must a body be projected that it may go round the earth, and rise to the top of the inclined plane?

MATHEMATICAL CORRESPONDENCE.

MATHEMATICAL QUESTIONS IN NO. 3 ANSWERED.

Qu. 23. *Answered by Y. of New Haven.*

By the question, $d\left(\frac{ydx}{dy}\right) = (dx^2 + dy^2)$; from which, if

dx be const. and $= 1$, $y^2 d^2 y^2 - 2y dy^2 d^2 y - dy^6 = 0$. By the aid of this equation, and the method of indeterminate coefficients, y may be expressed in a series of powers of x . But a much simpler series will result from an investigation of the

relation of z to y . The equation $z = \frac{ydx}{dy}$ gives $z^2 dy^2 - y^2$

$dz^2 + y^2 dy^2 = 0$. It is easily proved that the curve can never come in contact with the axis on which the absciss and subtangent are found. Let the arbitrary value of y when $x = 0$, be denoted by a , assume $y = a + Bz + Cz^2 + Dz^3 + \&c.$ substitute in the above equation, make the co-efficients of the like powers of $y = 0$, and the required equation is found $y = a$

$+ z - \frac{z^3}{6a^2} + \frac{z^4}{4a^3} - \frac{9z^5}{40a^4} + \frac{z^6}{18a^5} - \&c.$ This method

of expressing the equation, viz. by the relation between the ordinate and curve, is analogous to the method adopted for the catenary and some other curves. After a faithful trial of the methods of integration laid down by Lacroix, in his great work, as well as those of other authors, I am satisfied that it is impossible to express the relation between the ordinate and absciss, or even between the ordinate and curve, in finite algebraic terms. A very good answer was also sent by *Zero*.

Qu. 24. Answered by Mr. O'Shannessy, Albany.

Put a = half the given chord, x = versed sine, and b^2 = area of the segment ; then by mensuration, we have $\frac{1}{3}x\sqrt{(a^2 - \frac{2}{3}x^2)} = b^2$, nearly ; which equation solved, gives $x^2 = \sqrt{(d^4 + c^4) - c^2}$ (putting $80 a^2 \div 32 = 2c^2$, and $125 b^4 \div 32 = d^4$) $= c \times (\sqrt{(n^2 + c^2)} - c)$ (putting $cn = d^2$) whence we have the chord and versed sine of an arc, given, and from thence the radius may be easily found, and the req. seg. may be described on the given chord. MR. J. C. STRODE. Put a = half the given line, A , the given area, x , the height of the

seg. r = radius, $p = 7854$; then, $\frac{4ax}{3} + \frac{x^2}{4} = A$, nearly, or

$3x^3 + 16a^2x - 12aA = 0$, for a seg. less than a semi-circle,

and $4pr^2 - \frac{2ax}{3} - \frac{x^3}{2a} = A$, for a segment greater than a semi-

circle. From these two equations by reduction we have an equation of the 5. power, from whence by approximation x may be found, and the segment readily described. Y. of New Haven, after showing how the question may be resolved by series, gives the following practical method, from a table of the areas of circular segments. Let the versed sine be assumed as nearly as possible, from this and the given chord calculate the diameter, divide the assumed versed sine by this diameter, and look for the corresponding area in the table, multiply this area by the square of the diameter, and note the difference between this product and the given area ; obtain a second area in the same manner, and the common rules of false will give an approximation to the value of the versed sine. If necessary the operation may be repeated. He then proceeds in the same manner as in the first answer for another method of solution.

Qu. 25. Answered by Y. of New Haven.

Let x denote the sum of the payments made in any one year. The present worth of this sum may be regarded without sen-

sible error (according to the common rule for equation of payments) the same as if the whole were paid at the end of six months from the beginning of the year. Or, if we take the value of 2000*l.* six months before the deposit is made, the problem will be solved by finding an annuity, payable annually

for seven years, whose present worth shall be $2000 \times \frac{50}{51}$.

For this purpose the common formula in annuities at compound

interest give $x = \frac{50}{51} \times 2000 \times .04 \times (1.04)^7 \div (1.04)^7 - 1$

$= 326, 687$. And because there are $7 \times 51 + 1$ weekly payments in seven years, dividing the foregoing result by $51\frac{1}{2}$ we obtain 6.26523 or 6*l.* 5*s.* 3*d.* for the weekly allowance required. *Mr. O'Shannessy.* Put c = the amount of one pound in one year at 4 per cent. $= 1.00076712$, n the number of payments and x the weekly allowance required. Then c^n = the amount of 1 pound in 7 years, at compound interest, and $2000 \times c^n = 2645.88$ = the amount of 2000 in the same time. Now, it is manifest, that $x, cx, c^2x, c^3x, \dots, c^n x$ will denote the several amounts of the weekly allowances beginning

at the last, whose sum is $(c^n x - x) \div (c - 1)$, or $\frac{,3239547}{,00076712}$

$\times x = 2645,80$, because the sum is to be exhausted; therefore, $x = 6*l.* 5*s.* 4*d.*$ nearly, is the weekly allowances required. In the same manner it was answered by *Mr. O. Reynolds, Baltimore.* *Mr. Strode* finds $x = 6*l.* 5*s.* 7*d.*$ *Mathetes,* 6.265 pounds.

Qu. 26. answered by Zero.

Let x, y, z , denote the numbers; by the question $x + y - z = a^2$, a square, $x + z - y = b^2$ = a square, $z + y - x = c^2$ = a square, and $x + y + z = d^2$. Add the three first equations, and we have $x + y + z = a^2 + b^2 + c^2 = d^2$ by the

4. equation. Add the first and second equation together and we have $x = \frac{1}{2}(a^2 + b^2)$, also the 1. and 3. and we have $y = \frac{1}{2}(a^2 + c^2)$ in like manner adding the 2. and 3. we get $z = \frac{1}{2}(b^2 + c^2)$; hence, then, we must assume a^2 , b^2 , and c^2 , so that their sum shall make a square, and also (since $x = \frac{1}{2}(a^2 + b^2)$) $y = \frac{1}{2}(a^2 + c^2)$ and $z = \frac{1}{2}(b^2 + c^2)$) x , y , z , are to be whole numbers by the question therefore the above values of x , y , z , must be multiples of 2. Now all the above conditions will be satisfied by assuming $a^2 = 16 m^4$, $b^2 = 16 m^2 n^2$ and $c^2 = 4 n^4$, where any whole numbers whatever may be assumed for m and n ; hence $x = \frac{1}{2}(a^2 + b^2) = \frac{1}{2}(16 m^4 + 16 m^2 n^2) = 8 m^4 + 8 m^2 n^2$, and in the same manner y is found $= 8 m^4 + 2 n^4$, and $z = 8 m^2 n^2 + 2 n^4$; which will give the three numbers required. If $m = 1$, and $n = 1$, then $x = 16$, $y = 10$ and $z = 10$. If $m = 2$ and $n = 1$, then $x = 160$, $y = 130$, and $z = 34$. &c. Again by *Mr. O Reynolds*. Put $34 n^2 + x$, $34 n^2 - x$ and $32 n^2$ for the required numbers, all the conditions will be answered if $32 n^2 + 2 x$, and $32 n^2 - x$, are but squares. Put $32 n^2 + 2 x = m^2$, then $x = \frac{1}{2}(m^2 - 32 n^2)$, which substituted in the second square gives $64 n^2 - m^2 = (8 n - am)^2$, by assumption. Solved $m = 16 an \div (a^2 + 1)$; where a , and n , may be taken at pleasure. If $a = 2$, and $n = 5$, then $m = 32$, $x = 112$, and the required numbers 962, 738 and 800. *Mr. O. Shannessy's* solution is similar to the above by *Zero*. *Mathetes'* numbers are 34, 130, and 160.

Qu. 27. answered by Y.

In solving this problem it will be most convenient to begin with denoting the radius of the earth by unity, and finding the area contained between the equator, the meridians, and the rhumb-line. This surface may be conceived to be generated by the revolution of a variable portion of the meridian. Let the arc of the equator terminated at one end by any fixt point, and at the other by the generating arc of the meridian, be de-

noted by x , and the meridian by y . If t be the tangent of the course, and the contemporaneous increments of the equator and meridian be represented by dx, dy ; tdy will be the distance between two successive positions of the meridian measured on a parallel of lat. Hence as the distance between the successive positions of the meridian, at different points, is as the cos. of the lat. we have $\cos y dx = t dy$. But while the equator receives the increment dx , the area in question, by the rule for areas contained between meridians and parallels, is increased by $dx \sin y$; therefore the differential of the area = $\frac{t \sin y}{\cos y} \times dy = t \times \tan y dy$. But if $s = \sec y$, $dy = \frac{ds}{s \sqrt{s^2 - 1}}$

therefore $t + \tan y dy = t \times \frac{ds}{s}$, and the area = $t \times \log. s +$

C. To find C, the area must be supposed to vanish at some determined lat. whose sec. is s' , which gives $C = -t \log. s'$,

and the corrected area = $t \times \log. \frac{s}{s'}$. Let a denote the length of the arc of the equator (to rad. 1) contained between the two bounding meridians, $a \times 1$, or a will be the measure of the half line contained between that arc and the two meridians;

therefore $a - t \log. \frac{s}{s'}$, is the area required. The value of t

may be calculated by Mercator's sailing, but the formula may be freed from it, in the following manner. If c be taken = $s + \sqrt{s^2 - 1}$, or = $\cot \frac{1}{2} \text{ co. lat.}$ and $c' = s' + \sqrt{s'^2 - 1}$;

the mer. diff. lat. is known to be = $\log. \frac{c}{c'}$. Hence mer. diff.

lat. : diff. long. :: rad. : tan. course (since $a = \text{diff. long. to rad.}$

1.) $t = \frac{a}{\log. c - \log. c'}$. By substit. the required area = $a (1 -$

$\frac{l. s - l. s'}{l. c - l. c'}$,) to the rad. 1. : Or as similar surfaces of spheres

are as the squares of their radii $= ar^2 \times (1 - \frac{l. s - l. s'}{l. c - l. c'})$

to radius r . In the numerical computations of this formula, the tan. and sec. of the ordinary tables may be used, as the modulus equally affects the numerator and denominator of the

fraction $\frac{l. s - l. s'}{l. c - l. c'}$. In the example proposed the frac-

tion becomes $\frac{.0424818}{.1548652}$; and the area sought $= 5347755$

miles, which is true to the last figure. Zero's solution is very similar, and brings out the same numerical result.

Again by Mr. O'Connor, New-York.

Let dz = the differential of any variable arc z of a meridian, between the equator and proposed rhumb; t = the tang. of the angle made by said meridian and rhumb, to radius 1. Then $1 : t :: dz : tdz$ = the differential of the arc of that parallel of lat. passing through the end of z , and commencing at the mer.

of Baltimore. But $\cosin z : 1 :: tdz : \frac{tdz}{\cosin z}$ = the dif. of

that arc of the equator corresponding to the above. Now $t \times \frac{dz \sin z}{\cosin z}$ = the dif. of the space bounded by the given meri-

dians, rhumb and equator. But $t \times \frac{dz \sin z}{\cosin z} = t \times \int \frac{-d. \cos z}{\cosin z}$

= the dif. of a log. of which the integral is $t \times \frac{-d. \cos. z}{\cosin z} =$

$t \times (-h, \log. \cos. z + c)$. (Lacroix diff. cal. p. 34 and 269.)

When the area begins $c = h. \log. \cos. z$. Putting $L =$ the lat. of Dublin, $l =$ that of Baltimore, $M = 2.302585093$ and $R = 3979$; the area of the above space on the surface of our sphere will be $MR^2 t \times (\log. \sec. L - \log. \sec. l) = 14028940$ miles. But the trian. bounded by the said meridians and equator is $=$ the difference of long \times rad. $= 194943147$ miles, consequently $19494321 - 14146933 = 5346187$ the area required. Similar to this is the answer by Mr. O'Shannessy.

NEW MATHEMATICAL QUESTIONS.

Qu. 39. by C. H.

B bought 10 nutmegs, and paid for 3 nuts as much more than 4 pence, as 4 cost him more than 10 pence; what did the 10 cost?

Qu. 40. by C. H.

The size of a room is such that if it had been 2 feet broader and 3 longer, it would have contained 64 more square feet; and if it had been 2 feet longer and 3 broader, it would have contained 68 more square feet; what is the length and breadth of the room?

Qu. 41. by C. H.

An officer has three companies; one riflemen, one grenadiers, and one militia. He intends to storm a fort, and will give his men 901 crowns on these terms; viz. that each soldier of the company which commences the attack shall receive one crown, and the rest of the money be equally distributed. If the riflemen are first, each soldier in the other companies receives $\frac{1}{2}$ a crown; if the grenadiers are first, each of the other soldiers receives $\frac{1}{3}$ of a crown; if the militia are first, each of the other receives $\frac{1}{4}$ of a crown. How many men are there in each company?

Qu. 42. by Mr. O'Connor.

The height of a conical glass filled with water, its top diam. and the transverse axis of an oblong heavy spheroid placed upright in it, are 6 inches each ; required the spheroid's magnitude, the water displaced being a maximum ?

Qu. 43. by Y. of New Haven.

Find three positive rational numbers x, y, z , such that $x^2 - y, x^2 - z, y^2 - x$, and $y^2 - z$, may all be squares.

Qu. 44 Mr. O. Reynolds, College, Baltimore.

There is a rod lying horizontally, one end of which is raised up in a vertical plane, with an uniform angular motion, while the other end moves forward in a straight line, the angular velocity of the rod being such that when the lower end advances to the point of the horizontal plane where the first end was placed, the rod lies again horizontally in the same place as at the first, but in an inverted position ; the area of the curve described by the upper end of the rod is required ?

The following gentlemen answered the questions as below.

Analyticus	24.	25.	26.	27.
Mr. Rt. Maar,	24.	25.	26.	27.
Mathetes,	24.	25.	26.	27.
Mr. O'Connor,	24.	25.	26.	27.
Mr. O'Shannessy	24.	25.	26.	27.
Mr. O. Reynold's, P. M.	24.	25.	26.	27.
Mr. Strobe, E. Bradford,	24.	25.	26.	
Y. of New Haven,	24.	25.	26.	27.
Zero,	24.	25.	26.	27.

An Essay on the Domestic Cat will appear in our next.

